

## CLAIMS

✓ Claims 1-8 previously canceled.

✓ Claims 9-16 currently canceled.

---

17. (New) An enhanced volume phase grating assembly for use in wavelength division multiplexing of signals having wavelengths within a wavelength range, comprising:

a support substrate;

a volume phase medium adjacent to and supported by the support substrate;

a protective layer adjacent to the volume phase medium, configured to protect the volume phase medium;

the volume phase medium including a material having material properties including :

an angle of diffraction,  $\theta$ , that is greater than 30 degrees;

an effective thickness,  $T$ , that is less than 30 microns;

a bulk refractive index,  $n$ ; and

a peak modulation value,  $\Delta n$ , of the bulk refractive index that is greater than 0.1;

wherein the material properties of the material of the volume phase medium are cooperatively selected to simultaneously maximize S and P diffraction efficiencies of the enhanced volume phase grating assembly to thereby provide high dispersion, low polarization dependent loss, and uniformly high diffraction efficiency across substantially all of the wavelength range.

18. (New) The enhanced volume phase grating assembly of claim 17, wherein the

volume phase medium includes dichromated gelatin.

19. (New) The enhanced volume phase grating assembly of claim 17, wherein the peak modulation value  $\Delta n$  is about 0.2.

20. (New) The enhanced volume phase grating assembly of claim 17, wherein the support substrate and the cover are each comprised of a substantially transparent material.

*Ex Cm*  
21. (New) The enhanced volume phase grating assembly of claim 20, further including a reflective surface, disposed adjacent to the volume phase medium and configured to reflect a diffracted beam toward and into the enhanced volume phase grating assembly.

22. (New) The enhanced volume phase grating of claim 20, wherein external surfaces of the support substrate and the cover are coated with an anti-reflection coating configured to substantially equally minimize overall loss for both S-polarized light and P-polarized light in the wavelength range.

23. (New) The enhanced volume phase grating of claim 20, wherein external surfaces of the support substrate and the cover are coated with an anti-reflection coating configured to minimize, to a first degree, overall loss for S-polarized light and minimize, for a second, lesser degree, overall loss for P-polarized light in the wavelength range.

24. (New) An enhanced volume phase grating assembly for use in wavelength division multiplexing of signals having wavelengths within a wavelength range, comprising:

a support substrate;

a volume phase medium adjacent to and supported by the support substrate;

a protective layer adjacent to the volume phase medium, configured to protect the volume phase medium;

the volume phase medium including a material having material properties including:

an internal angle of deviation,  $2\theta$ ; and

a Kogelnik parameter  $\nu$ ;

the volume phase medium having:

an S diffraction efficiency,  $E_S$ , defined by the equation  $E_S = \sin^2 \nu$ ; and

a P diffraction efficiency,  $E_P$ , defined by the equation  $E_P = \sin^2(\nu \cos 2\theta)$ ;

respective values of  $2\theta$  and  $\nu$  of the volume phase medium material being selected such that  $E_S$  and  $E_P$  are both simultaneously established to be greater than about 90%, to thereby provide high dispersion, low polarization dependent loss, and uniformly high diffraction efficiency across substantially all of the wavelength range.

25. (New) The enhanced volume phase grating assembly of claim 24, wherein the volume phase medium includes dichromated gelatin.

26. (New) The enhanced volume phase grating assembly of claim 24, wherein a peak modulation value,  $\Delta n$ , of the volume phase grating assembly is about 0.2.

27. (New) The enhanced volume phase grating assembly of claim 24, wherein the support substrate and the cover are each comprised of a substantially transparent material.

28. (New) The enhanced volume phase grating assembly of claim 27, further including a reflective surface, disposed adjacent to the volume phase medium and configured to reflect a diffracted beam toward and into the enhanced volume phase grating assembly.

*end*

29. (New) The enhanced volume phase grating of claim 27, wherein external surfaces of the support substrate and the cover are coated with an anti-reflection coating configured to substantially equally minimize overall loss for both S-polarized light and P-polarized light in the wavelength range.

30. (New) The enhanced volume phase grating of claim 27, wherein external surfaces of the support substrate and the cover are coated with an anti-reflection coating configured to minimize, to a first degree, overall loss for S-polarized light and minimize, for a second, lesser degree, overall loss for P-polarized light in the wavelength range.

---